

EFFICACY COMPARISON OF SPLINT AND ORAL STEROID THERAPY IN NERVE CONDUCTION VELOCITY AND LATENCY MEDIAN NERVE IN CARPAL TUNNEL SYNDROME

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ABSTRACT

Objectives: To evaluate the effects of splinting in neutral position of the wrist and oral Prednisolone on neurophysiologic variables in patients with Carpal tunnel syndrome (CTS).

Methodology: This double blind study was carried out in 48 idiopathic CTS patients. They were randomly divided in two groups. Splint group (N=24) used splint for six weeks; and steroid group (N=24) who got oral Prednisolone 20mg/day for two weeks. Electrophysiological evaluations were done initially for having baseline and after 1.5-months follow up. SPSS software (version 11) and independent T test and paired T test were used for statistical analysis.

Results: After six weeks median nerve motor and sensory had distal latency and their conduction velocity improved significantly in both groups ($P<0.05$). There was no significant difference between both groups due to electro physiologic improvement and clinical improvement.

Conclusion: There was significant electro physiologic improvement in both groups, at six weeks. On comparing the efficacy of the two treatment methods, there was no significant difference between the two.

KEY WORDS: Carpal tunnel syndrome, Neuro-electrophysiology, Oral steroids, Splinting.

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INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common focal compressive neuropathy and it is caused by entrapment of the median nerve

in the carpal tunnel. Prevalence of symptomatic CTS that were confirmed electrophysiologically is about 3% in females and 2% in males with peak prevalence in females over 55 years old.¹ Early diagnosis and treatment of CTS are important because any delay can cause irreversible median nerve damage with persistent symptoms and permanent disability. Treatment options include rest and avoidance of excessive hand activity, exercises, laser therapy, wrist splinting in neutral position, non steroidal anti-inflammatory drugs, oral steroids, local corticosteroid injections and surgery to decompress the median nerve segment.²

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Table-I: The electrophysiological criteria for diagnosing CTS

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|---|
| <ol style="list-style-type: none"> 1. Median nerve motor distal latency recording at abductor pollicis brevis and wrist stimulating greater than 4.4ms. 2. Median nerve antidromic sensory peak latency recording at digit II greater than 3.5ms. 3. Difference between antidromic median Sensory latency and ulnar sensory latency at digit IV greater than 0.5ms. 4. Antidromic latency difference more than 0.5ms between median nerve at digit II and ulnar nerve at digit V. 5. The same distance of measurement. |
|---|

Wrist splinting in neutral position has been reported to provide symptomatic relief.^{3,4} Oral steroid therapy can cause significant decrease in CTS symptoms in past studies.⁵⁻⁷ In this study we compared effects of wrist splinting in neutral position and oral Prednisolone on neurophysiologic variables in patients with CTS.

METHODOLOGY

This double blind study was carried out in 48 idiopathic CTS patients (44 female and 4 male) between 21 to 65 year of age (average age of 42.19 year) during December 2005 and October 2006. They were randomly divided in to two groups. Splint groups (N=24) used splint for six weeks; and steroid group (N=24) used oral Prednisolone 20mg/day for two weeks.

This study was approved by the ethical research committee of Jundishapour University Institute. CTS cases were selected from patients with clinical diagnosis of carpal tunnel syndrome for at least one month and by electrophysiological evidence of median neuropathy. These cases were referred from various clinics such as internal medicine, orthopedic, rheumatologic and general practitioners. The American Academy of Neurology criteria were used for diagnosis of CTS.⁸

The electrophysiological criteria that were used for diagnosis of CTS were accepted by presence of two or more in Table-I.⁹ Splint group were advised to wear commercially available carpal tunnel splint at night for as long if possible during the daytime for six weeks. In the case of bilateral symptoms, both hands were treated. The patients were also asked not to use additional medicines or other methods of treatment during the study period.

Patients in steroid group were given oral prednisolone 20mg/day for two weeks, as described in previous studies.⁶ They were advised to avoid extreme wrist flexion or extension, excessive hand movement and hand rest was common to both groups. Outcome measures were median nerve sensory and motor distal latency and conduction velocity. Nerve conduction study was performed at baseline and also at six week follow-up. Exclusion criteria are noted in Table-II

Motor and sensory conduction studies of median and ulnar nerve were performed on both hands. The parameters that were recorded include distal latency and conduction velocity. SPSS software (version 11) and independent T test and paired T test were used for statistical analysis.

Table-II: The electrophysiological exclusion criteria for diagnosing CTS

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| <ol style="list-style-type: none"> 1. Patients with diabetes mellitus, trauma to wrist and deformity. 2. Any patient with evidence of generalized neuropathy /radiculopathy on electrodiagnostic study. 3. Patients with advanced CTS having wasting, marked weakness with marked axonal loss on nerve conduction study or nonstimulatable nerves. 4. Patients with a history of peptic ulcer. 5. Patients treated previously for CTS using medical or surgical therapy. 6. Pregnant women with CTS. 7. Patients with systemic disorders like rheumatoid arthritis, hypothyroidism, amyloidosis, etc. |
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Table-III: Treatment outcome of two groups Steroid group (N=22)

| Parameter | Baseline | 1.5 – Monthly | Mean change Mean \pm SD(P-value) |
|-----------------------------|-------------------|-------------------|------------------------------------|
| MDL (m/sec) | 5.05 \pm | 4.92 \pm 0.91 | 0.12 \pm 0.20(0.01) |
| MCV(m/sec) | 49.95 \pm 5.12 | 49.97 \pm 4.95 | -0.018 \pm 0.76(0.91) |
| SDL (m/sec) | 4.00 \pm 0.70 | 3.31 \pm 0.45 | 0.69 \pm 0.30(0.0001) |
| SCV(m/sec) | 38.21 \pm 9.55 | 44.38 \pm 8.47 | -6.17 \pm 1.82(0.0001) |
| <i>Splint group (N=21)</i> | | | |
| MDL(m/sec) | 5.27 \pm 1.17 | 5.21 \pm 1.17 | 0.059 \pm 0.14(0.077) |
| MCV(m/sec) | 53.13 \pm 4.61 | 52.04 \pm 4.46 | 0.08 \pm 0.88(0.663) |
| SDL(m/sec) | 4.13 \pm 0.78 | 3.51 \pm 0.78 | 0.61 \pm 0.23(0.0001) |
| SCV(m/sec) | 36.47 \pm 13.49 | 41.46 \pm 12.51 | -4.99 \pm 2.50(0.0001) |

* MCV: Motor conduction velocity, MDL: Motor distal latency, SDL: Sensory distal latency SCV: Sensory conduction velocity

RESULTS

There was statistically no significant difference between the age and sex distribution of the patients in two groups. Average age in splint group was 43/88 (two men and twenty two women) and average age in steroid group was 40/50(two men and twenty two women). Overall, incidence of CTS was almost ten times more in females as compared to males. In splint group three patients and in steroid group two patients didn't complete the study and were eliminated. There were no statistically significant differences between the two groups. Treatment outcome of both groups are noted in Table-III and their comparison in Table-IV. In both groups there was significant improvement in sensory distal latency sensory conduction velocity after six weeks follow up. ($P < 0.05$) but motor conduction velocity did not have any significant improvement. ($P > 0.05$). There was no significant difference between two groups after six weeks follow-up.

DISCUSSION

Splint as well as steroid therapy both is effective in nerve conduction velocity and latency median nerve in carpal tunnel syndrome. There was no significant difference

in both groups after six week follow up. We choose oral steroids because injection of steroids was reported to have mechanical or chemical nerve injury and there is a poor acceptance for injections among several patients. Age distribution in our study is similar to past studies, but sex distribution is higher^{5,10,11} In past studies there are variable reports of successfulness rates of using splint (31 to 67%)^{4,12} In Herskovitz et al study all oral steroids treated patients were reported significant improvements after two weeks. The effect was rapid, but gradually waned over eight weeks of observation.⁷

Chang et al didn't find any significant difference between treatment after two weeks with 20mg oral Prednisolone followed by 10 mg Prednisolone for two weeks.. After one year follow-up, improvement decreased to 51% that is suggesting relapse of symptoms in 17% of patients who had responded to treatment after one month.⁶

Oral steroids are safe and well tolerated at low dose in the short term. During steroid therapy one should be careful about its side effects such as cushingoid features, avascular necrosis, gastrointestinal problems, diabetes, hypertension etc.

Table-IV: Outcome Comparison of two groups

| Parameter | Splint (Mean \pm SD) | Steroid (mean \pm SD) | P-value |
|------------|------------------------|-------------------------|---------|
| MDL(m/sec) | 0.059 \pm 0.14 | 0.12 \pm 0.20 | 0.36 |
| MCV(m/sec) | 0.08 \pm 0.88 | -0.018 \pm 0.76 | 0.15 |
| SDL(m/sec) | 0.61 \pm 0.23 | 0.69 \pm 0.30 | 0.22 |
| SCV(m/sec) | -4.99 \pm 2.50 | -6.17 \pm 1.82 | 0.37 |

In Burke et al study 17% of patients reported the worse symptoms between two weeks and two months follow-up after splint use.⁴ Graham et al, combined splinting and steroid injection. Patients were followed up for one year. They found that this kind of treatment is effective for relief of CTS symptoms but it has only 10% long-term effects.¹³ Gleeman et al showed that 89% of severe CTS patients (constant numbness, weakness, atrophy or sensory loss) had recurrence within a year, while only 60% mild CTS patients (intermittent symptoms and normal sensory and motor examination) had recurrence after using splint and local injection.¹⁴

Our study has certain limitations like short follow-up and a limited number of cases in both groups. So we recommend further studies with more cases and longer follow up period.

CONCLUSION

Both treatment methods (splint and oral steroids) are effective but they don't have any significant difference between two methods after six weeks follow up.

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